

CLAIMS

1. A gas supply system for supplying a specific material gas into a processing apparatus in order to provide specific processing to an object to be processed wherein said material gas is produced from metallic compound material with low vapor pressure, said system characterized by comprising:

a gas passage extending to said processing apparatus;
a material reservoir tank attached to one end of said gas passage for containing said metallic compound material therein; and
a first carrier gas supply means connected to said material reservoir tank into which a carrier gas is fed,
wherein said first carrier gas supply means comprises a gas diffusion chamber provided in a bottom portion of said material reservoir tank, and a gas injection plate separating said gas diffusion chamber and having a number of gas injection holes.

2. A gas supply system as described in claim 1, characterized in that a porous fluorinated resin layer is provided on a gas injection surface of said gas injection plate.

3. A gas supply system as described in claim 2, characterized in that said gas injection plate is made of porous fluorinated resin.

4. A gas supply system as described in any one of claims 1 to 3, characterized in that a material heating means is provided in said material reservoir tank for heating said metallic compound material.

5. A gas supply system as described in claim 4, characterized in that said material heating means is provided in the bottom portion of said material reservoir tank.

6. A gas supply system as described in claim 5, characterized in that said material heating means is implanted in said gas injection plate.

7. A gas supply system as described in any one of claims 1 to 6, characterized in that said gas injection plate comprises a shower portion having a number of gas injection holes, wherein said shower portion is supported by support members on said bottom portion, each of the support members having a hollow portion inside, and each of said hollow portion provides atmospheric air.

8. A processing system comprising: a processing apparatus including a gas injection means for injecting a specific material gas into a processing vessel in order to provide specific processing to an object to be processed, said material gas being produced from metallic compound material with low vapor pressure; and a gas supply system for supplying said specific material gas to said gas injection means, wherein:

 said gas injection means is a showerhead portion; and

 said gas supply system is characterized by comprising:

 a gas passage extending upwardly from said showerhead portion;

 a material reservoir tank attached to an upper-end portion of said gas passage for containing said metallic compound material therein; and

 an open/close valve for opening/closing said gas passage.

9. A processing system as described in claim 8, characterized in that said upper-end portion of said gas passage is inserted in said material reservoir tank and said open/close valve is provided for opening/closing an opening of the upper-end portion of said gas passage.

10. A processing system as described in claim 8, characterized in that said open/close valve is intermediately inserted in said gas passage.

11. A processing system as described in any one of claims 8 to 10, characterized in that a first carrier gas supply means is provided in said material reservoir tank for feeding a carrier gas in

said material reservoir tank.

12. A processing system as described in claim 11, characterized in that said first carrier gas supply means comprises: a gas diffusion chamber provided in a bottom portion of said material reservoir tank; and a gas injection plate separating said gas diffusion chamber and having a number of gas injection holes.

13. A processing system as described in claim 12, characterized in that a porous fluorinated resin layer is provided on a gas injection surface of said gas injection plate.

14. A processing system as described in claim 12, characterized in that said gas injection plate is made of porous fluorinated resin.

15. A processing system as described in any one of claims 8 to 14, characterized in that a material heating means is provided in said material reservoir tank for heating said metallic compound material.

16. A processing system as described in claim 15, characterized in that said material heating means is provided in said bottom portion of said material reservoir tank.

17. A processing system as described in claim 16, characterized in that said material heating means is implanted in said gas injection plate.

18. A processing system as described in any one of claims 8 to 17, characterized in that a purge gas feed pipe is provided in the proximity of said showerhead portion for feeding a purge gas in said showerhead portion.

19. A processing system as described in any one of claims 15 to 17, characterized by comprising:
a temperature detecting means for detecting the temperature of

said material heating means; and
a controller for controlling said material heating means so that a value detected by said temperature detecting means is maintained around a specific value.

20. A processing system as described in any one of claims 15 to 17, characterized by comprising:

a pressure detecting means for detecting the pressure inside said gas passage or said material reservoir tank; and
a controller for controlling said material heating means so that a value detected by said pressure detecting means is maintained around a specific value.

21. A processing system as described in any one of claims 15 to 17, characterized by comprising:

an orifice means provided inside said gas passage for providing a sonic nozzle condition;
a pressure detecting means for detecting pressure at an upstream side of the orifice means; and
a controller for controlling said material heating means or said first carrier gas supply means so that a value detected by said pressure detecting means is maintained around a specific value.

22. A processing system as described in any one of claims 15 to 17, characterized by comprising:

a partial pressure detecting means for detecting the partial pressure of a material gas inside said gas passage or material reservoir tank, said material gas being produced from the metallic compound material; and
a controller for controlling said material heating means so that a value detected by said partial pressure detecting means is maintained around a specific value.

23. A processing system as described in any one of claims 15 to 17, characterized by comprising:

a gas flow detecting means for detecting the amount of gas flowing

through said gas passage; and
a controller for controlling said material heating means so that a value detected by said gas flow detecting means is maintained around a specific value.

24. A processing system as described in any one of claims 15 to 17, characterized by comprising:

a second carrier gas supply means connected to said gas passage; a gas flow detecting means provided at said gas passage on a downstream side of a connection point of said second carrier gas supply means and said gas passage for detecting the gas flow amount flowing through said gas passage; and
a controller for controlling the gas flow amount of each of said first and second carrier gas supply means so that the flow amount of a material gas within said gas flow is maintained at a constant amount, said material gas being produced from said metallic compound material.

25. A processing system as described in any one of claims 8 to 24, characterized in that material heating means are provided at the bottom portion, a side portion and a ceiling portion of said material reservoir tank respectively and said material heating means can be controlled separately.

26. A processing system comprising: a processing apparatus including a gas injection means for injecting a specific material gas into a processing vessel in order to provide specific processing to an object to be processed, said material gas being produced from metallic compound material with low vapor pressure; and a gas supply system for supplying said specific material gas to said gas injection means, wherein said gas supply system is characterized by comprising:

a material reservoir tank for containing said metallic compound material therein;

a gas passage for connecting said material reservoir tank to said gas injection means of said processing vessel;

a first carrier gas supply means connected to said material reservoir tank for feeding a carrier gas therein;
a material heating means provided at said material reservoir tank for heating metallic compound material inside said material reservoir tank;
a detecting means for detecting the conditions inside said gas passage or said material reservoir tank; and
a controller for a control for a value detected by said detecting means to be maintained around a specific value.

27. A processing system as described in claim 26, characterized in that said detecting means is a temperature detecting means for detecting the temperature of said material heating means and said controller controls said material heating means so that a value detected by said temperature detecting means is maintained around a specific value.

28. A processing system as described in claim 26, characterized in that said detecting means is a pressure detecting means for detecting the pressure inside said gas passage or said material reservoir tank and said controller controls said material heating means so that a value detected by said pressure detecting means is maintained around a specific value.

29. A processing system as described in claim 26, characterized in that an orifice means is provided inside said gas passage to provide a sonic nozzle condition, said detecting means is a pressure detecting means for detecting pressure at an upstream side of said orifice means, and said controller controls said material heating means or said first carrier gas supply means so that a value detected by said pressure detecting means is maintained around a specific value.

30. A processing system as described in claim 26, characterized in that said detecting means is a partial pressure detecting means for detecting the partial pressure of a material gas inside said gas

passage or said material reservoir tank, said material gas being produced from metallic compound material, and said controller controls said material heating means so that a value detected by said partial pressure detecting means is maintained around a specific value.

31. A processing system as described in claim 26, characterized in that said detecting means is a gas flow detecting means for detecting the gas flow amount flowing through said gas passage and said controller controls said material heating means so that a value detected by said gas flow detecting means is maintained around a specific value.

32. A processing system as described in claim 26, characterized in that: a second carrier gas supply means is connected to said gas passage; said detecting means is a gas flow detecting means provided at said gas passage on a downstream side of a connection point of said second carrier gas supply means and said gas passage for detecting the gas flow amount flowing through said gas passage; and said controller controls the gas flow amount of each of said first and second carrier gas supply means so that the flow amount of a material gas within said gas flow is maintained at a constant amount, said material gas being produced from said metallic compound material.

33. A processing system as described in any one of claims 26 to 32, characterized in that said first carrier gas supply means comprises: a gas diffusion chamber provided in a bottom portion of said material reservoir tank; and a gas injection plate separating said gas diffusion chamber and having a number of gas injection holes.

34. A processing system as described in claim 33, characterized in that a porous fluorinated resin layer is provided on the gas injection surface of said gas injection plate.

35. A processing system as described in claim 33, characterized in that said gas injection plate is made of porous fluorinated resin.

36. A processing system as described in any one of claims 26 to 35, characterized in that material heating means are provided at the bottom portion, a side portion and a ceiling portion of said material reservoir tank respectively and said material heating means can be controlled separately.

37. A processing system as described in any one of claims 26 to 36, characterized in that a gas outlet to which said gas passage is connected is provided in the ceiling portion of said material reservoir tank and a baffle plate member is provided to cover said gas outlet in order to prevent any metallic compound material other than gas from entering inside said gas outlet.

38. A processing system as described in claim 37, characterized in that said baffle plate member is provided in a configuration that a surface of said metallic compound material cannot directly be seen from said gas outlet.

39. A processing system as described in claim 37 or 38, characterized in that said baffle plate member is made of a material with good heat conductance.

40. A processing system as described in any one of claims 37 to 39, characterized in that said baffle plate member is provided with an inclination relative to the horizontal.

41. A processing system as described in any one of claims 37 to 40, characterized in that said baffle plate member is constituted by a bending plate in a form of U-shape in cross-section.

42. A processing system as described in claim 41, characterized in that two plates with different dimensions are provided as said bending plate and said two plates of bending plates are partially

mutually inserted to fit together.

43. A processing system as described in any one of claims 37 to 40, characterized in that said baffle plate member is constituted by a disc plate.

44. A processing system as described in any one of claims 37 to 40, characterized in that said baffle plate member is constituted by a conical plate.

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